REMARKS

Claims 1-3, 5-7, 9-11, 13-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasanuma et al in view of Sverdlov. Applicants respectfully traverse the rejection.

Claim 1 is amended to recite:

> 1. (Twice Amended) A light emitting device comprising:
> a substrate;
> a first conductivity type layer overlying the substrate;
> a lower confinement layer overlying the first conductivity type layer, the lower confinement layer comprising $In_xGa_{1-x}N$, wherein $0 \leq x \leq 0.15$;
> a spacer layer overlying the lower confinement layer;
> an active region overlying the spacer layer, the active region comprising:
> a quantum well layer; and
> a barrier layer comprising indium;
> a cap layer overlying the active region;
> an upper confinement layer overlying and adjacent to the cap layer, the upper confinement layer comprising $In_xGa_{1-x}N$, wherein $0 \leq x \leq 0.15$; and
> a second conductivity type layer overlying the upper confinement layer;
> wherein:
> the spacer layer and the cap layer have larger band gaps than the quantum well layer;
> the upper confinement layer and the lower confinement layer have larger band gaps than the spacer layer and the cap layer; and
> one of the spacer layer and the cap layer comprises indium.

As amended, claim 1 recites a device with a lower confinement layer and a spacer layer on a first side of the active region, and an upper confinement layer and a cap layer on a second side of the active region. The spacer layer and cap layer are closer to the active region than the upper and lower confinement layers. As recited in claim 1, "the spacer layer and the cap layer have larger band gaps than the quantum well layer," and "the upper confinement layer and the lower confinement layer have larger band gaps than the spacer layer and the cap layer." Accordingly, layers closer to the active region have smaller band gaps than layers further from the active region. In contrast, Fig. 5 of Sasanuma et al. teaches a device where the active region is adjacent to two AlGaN layers with band gaps higher than the n- and p-InGaN layers adjacent to the AlGaN layers. It would not be obvious to modify Sasanuma et

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al. to reduce the band gaps of the AlGaN layers to below the band gaps of the p- and n-InGaN layers, because the AlGaN layers have a high band gap to provide carrier confinement. A person of skill in the art would expect a device so modified to have poor carrier confinement. Sverdlov was cited as teaching that GaN can be substituted for AlGaN and adds nothing to the deficiencies of Sasanuma et al. Accordingly, Applicants respectfully submit that claim 1 is allowable over the combination of Sasanuma et al. and Sverdlov.

Claim 2 is amended to recite:

> 2. (Twice Amended) A light emitting device comprising:
> a substrate;
> a first conductivity type layer overlying the substrate;
> a lower confinement layer overlying the first conductivity type layer, the lower confinement layer comprising indium;
> a spacer layer overlying the lower confinement layer, the spacer layer comprising indium;
> an active region overlying the spacer layer, the active region comprising:
> a quantum well layer; and
> an InGaN barrier layer with an indium composition between about 1% and about 15%;
> a cap layer overlying the active region, the cap layer comprising indium;
> an upper confinement layer overlying the cap layer, the upper confinement layer comprising indium; and
> a second conductivity type layer overlying the upper confinement layer;
> wherein the spacer layer and the cap layer have larger band gaps than the quantum well layer.

As amended, claim 2 recites a device wherein a lower confinement layer, a spacer layer, a barrier layer, a cap layer, and an upper confinement layer all comprise indium. In contrast, Sasanuma et al. teaches that the layers adjacent to the active region should be AlGaN. Sverdlov is cited as teaching that GaN layers may be substituted for AlGaN. Even in combination, Sasanuma et al. and Sverdlov do not teach a device where a lower confinement layer, a spacer layer, a barrier layer, a cap layer, and an upper confinement layer all comprise indium as recited in claim 2. Accordingly, Applicants respectfully submit that claim 2 is allowable over the combination of Sasanuma et al. and Sverdlov.

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Claims 6, 7, 9, 11, 13, 14, 16, 17, and 20 depend from claim 1 and are therefore allowable for at least the same reason as claim 1. Claims 3, 5, 10 and 15 depend from claim 2 and are therefore allowable for at least the same reason as claim 2. Accordingly, Applicants respectfully request allowance of claims 1-3, 5-7, 9-11, 13-17, and 20.

Claims 4, 8, 12, and 21 are rejected under 102(b) as being anticipated by Sasanuma et al. in view of Sverdlov and further in view of Koide et al. Applicants respectfully submit that a 102(b) rejection is not proper, and treat the rejection as a 103(a) rejection. Claim 4 depends from claim 2. Claims 8, 12, and 21 depend from claim 1. Koide et al. adds nothing to the deficiencies of Sasanuma et al. and Sverdlov with respect to claims 1 and 2. Accordingly, Applicants respectfully submit that claims 4, 8, 12, and 21 are patentable over the combination of Sasanuma et al., Sverdlov, and Koide et al.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasanuma et al. in view of Sverdlov and further in view of Duggan. Claim 19 depends from claim 1. Duggan adds nothing to the deficiencies of Sasanuma et al. and Sverdlov with respect to claim 1. Accordingly, Applicants respectfully submit that claim 19 is patentable over the combination of Sasanuma et al., Sverdlov, and Duggan.

In view of the above arguments, Applicants respectfully request allowance of Claims 1-17 and 19-28. Should the Examiner have any questions, the Examiner is invited to call the undersigned at (408) 382-0480.

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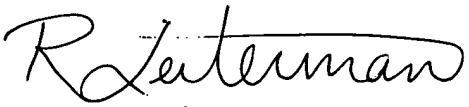
Respectfully submitted,



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ATTACHMENT A

IN THE CLAIMS

Claims are amended as follows:

1. (Twice Amended) A light emitting device comprising:

a substrate;

a first conductivity type layer overlying the substrate;

a lower confinement layer overlying the first conductivity type layer, the lower confinement layer comprising $In_xGa_{1-x}N$, wherein $0 \leq x \leq 0.15$;

a spacer layer overlying the [first conductivity type] lower confinement layer;

an active region overlying the spacer layer, the active region comprising[;] :

a quantum well layer; and

a barrier layer comprising indium;

a cap layer overlying the active region;

an upper confinement layer overlying and adjacent to the cap layer, the upper confinement layer comprising $In_xGa_{1-x}N$, wherein $0 \leq x \leq 0.15$; and

a second conductivity type layer overlying the [cap] upper confinement layer;

wherein:

the spacer layer and the cap layer [each] have [a] larger band gaps than the quantum well layer; [and wherein]

the upper confinement layer and the lower confinement layer have larger band gaps than the spacer layer and the cap layer; and

one of the spacer layer and the cap layer comprises indium.

2. (Twice Amended) A light emitting device comprising:

a substrate;

a first conductivity type layer overlying the substrate;

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a lower confinement layer overlying the first conductivity type layer, the lower confinement layer comprising [$In_xGa_{1-x}N$, wherein $0 \leq x \leq 0.15$] indium;

a spacer layer overlying the [first conductivity type] lower confinement layer, the spacer layer comprising indium;

an active region overlying the spacer layer, the active region comprising[;] :

a quantum well layer; and

an InGaN barrier layer with an indium composition between about 1% and about 15%;

a cap layer overlying the active region, the cap layer comprising indium;

an upper confinement layer overlying the cap layer, the upper confinement layer comprising [$In_xGa_{1-x}N$, wherein $0 \leq x \leq 0.15$] indium; and

a second conductivity type layer overlying the [cap] upper confinement layer;

wherein the spacer layer and the cap layer [each] have [a] larger band gaps than the quantum well layer [and wherein one of the spacer layer and the cap layer comprises indium].

10. (Amended) The light emitting device of Claim [1] 2 wherein:

the lower confinement layer has a first indium composition;

the spacer layer has a second indium composition;

the quantum well layer has a third indium composition;

the third indium composition is greater than the second indium composition; and

the second indium composition is greater than or equal to the first indium composition.

15. (Twice Amended) The light emitting device of Claim [1] 2 wherein:

the upper confinement layer has a first indium composition;

the cap layer has a second indium composition;

the quantum well layer has a third indium composition;

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the third indium composition is greater than the second indium composition; and

the second indium composition is greater than or equal to the first indium composition.

Please add the following new claims:

22. (New) The light emitting device of Claim 1 wherein the first conductivity type layer and the second conductivity type layer have larger band gaps than the lower confinement layer and the upper confinement layer.

23. (New) The light emitting device of Claim 1 wherein the spacer layer and the cap layer have larger band gaps than the barrier layer.

24. (New) The light emitting device of Claim 1 wherein the spacer layer comprises a composition graded from a first composition in a first region of the spacer layer to a second composition in a second region of the spacer layer, wherein:

the first region is closer to the lower confinement layer than the active region;

the second region is closer to the active region than the lower confinement layer; and

the second composition comprises a higher indium composition than the first composition.

25. (New) The light emitting device of Claim 1 wherein the cap layer comprises a composition graded from a first composition in a first region of the cap layer to a second composition in a second region of the cap layer, wherein:

the first region is closer to the upper confinement layer than the active region;

the second region is closer to the active region than the upper confinement layer; and

the second composition comprises a higher indium composition than the first composition.

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26. (New) The light emitting device of Claim 1 wherein the upper confinement layer comprises a composition graded from a first composition in a first region of the upper confinement layer to a second composition in a second region of the upper layer, wherein:

the first region is closer to the second conductivity type layer than the cap layer;

the second region is closer to the cap layer than the second conductivity type layer; and

the second composition comprises a higher indium composition than the first composition.

27. (New) The light emitting device of Claim 1 wherein the lower confinement layer comprises a composition graded from a first composition in a first region of the lower confinement layer to a second composition in a second region of the lower confinement layer, wherein:

the first region is closer to the first conductivity type layer than the spacer layer;

the second region is closer to the spacer layer than the first conductivity type layer; and

the second composition comprises a higher indium composition than the first composition.

28. (New) The light emitting device of Claim 2 wherein the spacer layer and the cap layer have indium compositions greater than the barrier layer.

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